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VOL. 8 MAY 1950 NO. 6

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GEORGE WASHINGTON UNIVERSITY

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THE MECHELECIV

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● EDUCATION FOR ENGINEERS.

Our first editorial of this school year discussed the good and bad points of present methods of bringing engineers and education into proximity. It is fitting that our last editorial of the year complete the discussion of this topic, which is one of vital importance to the profession.

The article featured in this issue gives one of the best surveys of the problem which it has been our good fortune to discover. It was obtained, quite by accident, by Dick Daniels, who heard the author speak on this subject in New York. Dick spoke to Mr. LaPierre after his remarks, and learned that he had written an article on the subject also. The seven thousand-plus well chosen words beginning on page four are the result. We recommend that you read the article carefully.

A general indictment of engineering education might be said to be that too much is given too quickly, and that much of what is given might be replaced by something more valuable, and be taught more intelligently.

Undergraduates can do little about the content of the course of instruction. That must be done gradually, by the profession and by a courageous experimental step on the part of progressive engineering school administrations. Undergraduates can, however do something about the quality of the instruction. We do not mean to imply that the quality here at George Washington is not as high as that elsewhere. We simply agree with Mr. LaPierre that much is to be desired everywhere, that the schools have not done their job well since the days when instruction was taken out of the hands of the craftsmen, and that certain improvements could and should be made.

Every year the Engineer's Council leaves a schedule of what it believes should be accomplished by the following year's council. We have a suggestion for an item to be included, at the top of the schedule, for the 1950-51 council. We believe that an "Instructor Rating System" would be beneficial to both the faculty and the student body in our engineering school. This system has been used with success by other universities. It gives the professors a chance to find out where they can do a better job; they are sincere, intelligent men who want to do a better job. It gives the student a chance to say the things about his instructor which he can never say in any other way, except over a beer or so with the boys. It is our contention that although the privilege may and probably occasionally will be abused, many of the things that would be said would help the professor and the school.

We think that next year's council should investigate the good and bad points of the "Instructor Rating System" as practiced at other universities. If it is found to be of real value, as we are sure it will be, the council should do everything in its power to see that the system is adopted at George Washington University.

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About Our Cover . . .

The television radiators and tower shown on the cover constitute the highest structure in Washington, partially by virtue of the elevation of its base. It belongs to station WOIC.

DON'T MISS THE

ENGINEER'S BANQUET

6:30 P.M. — YWCA — MAY 10

from the editor's mailbox

This space is intended to serve as a forum for student and alumni opinion. Opinions expressed are those of the writers, and not necessarily those of the MECHELECIV. *Address communications to: Editor's Mailbox, the Mechelociv, Student Union Annex, George Washington University.*

—THE EDITORS.

April 12, 1950

Dear Editor,

I was appalled to learn, from one of the active Sigma Tau brothers that the chapter has pledged sixty men this spring.

I found that several of the brothers had objected to the mass induction, but the argument used to get these men in was that the chapter was losing many men by graduation this time, and needed these men. Also that there had been great dissention in the chapter on who should be picked, so that they solved the difficulty by picking them all.

My point is that Sigma Tau is supposed to be an honorary society, and picks its men on three bases: scholarship, sociability, and practicality. In order to pledge sixty men, very nearly the whole top third must have been taken. My question is, were the prospective members screened on the latter two counts also? If they were, the men at GWU must have improved in average quality since my undergraduate days. I do not mean to criticize the men who were picked, almost all of whom I must admit I do not know, but I mean to criticize the chapter for being so free to hand out the key I had difficulty in earning.

Sigma Tau Alumnus.

● *Sigma Tau tells us it isn't so. They pledged 60 men all right, but they also passed over quite a few. —Ed.*

Dear Sir:

What has happened to the proposed engineers' Ring you have devoted space to in your previous issues? Inquiries at the Student Store invoke a run around unduplicated by any Federal Agency, a feat I have heretofore considered impossible. According to their stories the design has been in the hands of the powers-that-are for five or six months. If this is true why hasn't some action been taken? Surely this much time is adequate to consider a redesign of engineers instead of a simple little ring. The Engineers have been let down, and I propose a buttonholing campaign by all interested parties in which all "powers" are asked "What about it?" at each and every meeting.

Another previous article for which you deserve a bouquet is your article on Building X, the old vet. We have observed with interest the lack of progress of the wrecking crews, and our drawings continue to resemble the Fourier analysis of a Professor on his pogo stick.

Well, keep up the good work boys, and when we return in twenty years some eager freshman will point the joint out as the sacred shrine of the engineers, with the exception of the "heads", which are reserved for the Psycho's rabbit, guinea pigs and other rubbish.

Sincerely,
CATO THE ELDER.

● *The ring is still in the works, CATO, but Bldg. X will last forever, it seems.—Ed.*

An Intemperate View of Undergraduate Engineering Education

by Walter La Pierre

E.E. 1930, Polytechnic Institute of Brooklyn. (This is presently an abandoned undergraduate degree and corresponds to the familiar B.S. in E.E.)

M.E.E. 1936, Polytechnic Institute of Brooklyn. Junior engineer at the New York and Queens Electric Light and Power Company in Flushing, New York, 1930-35. Junior engineer at the Consolidated Edison Company of New York, New York City, 1936-37. Part-time instructor at City College, 1938-40. Laboratory assistant, Department of Electrical Engineering, School of Engineering, Columbia University, 1940-41; instructor, 1941-47; Assistant professor, 1947-50. Member of Tau Beta Pi, Sigma Xi, Theta Tau, Dumbells, Owls. Associate Member of the American Institute of Electrical Engineers, Member of American Society for Engineering Education. Faculty Advisor for the Columbia Chapter of Tau Beta Pi and the Columbia Student Branch of the American Institute of Electrical Engineers.

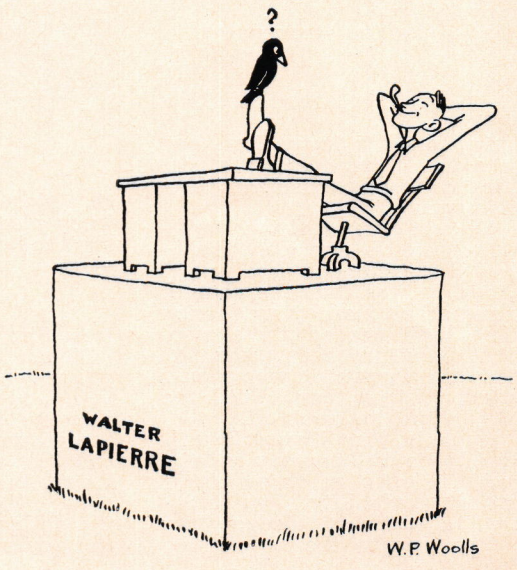
Foreword

It is possible to view the break of the dawn of the atomic age with equanimity, if one is dead; but under no other circumstances. The same may be said of engineering education.

Recently several new elements have been made. At least one of these can be caused to explode and to report thus on the veracity of the 1905 Einstein equation. There is one element which has no atomic number, although it is said to apply to the periodic table, but which is charged and which possesses explosive qualities. It has been discovered everywhere by all manner of *men* in all the ages of history. I refer to an element of truth. Upon consideration of of engineering education, one can discover several elements of truth in the criticisms tossed at it, in the praises which are its due and in the students, the facilities and the industries whose coexistence make it a going concern. The subject of engineering education is distressingly complicated and delightfully controversial.

The schools of engineering are professional schools, and the furnishing of minds which proceeds therein is known as professional education. From this the inference is occasionally implied that the other kind of education is amateur. The proper adjective is liberal, and the distinction between the professional and liberal education has been stated as a matter of the purpose of each; that professional education equips one to make a living while the other kind prepares one to live. This oversimplification sheds much light on the matter—monochromatic light, which reveals the form of things but alters their colors.

There is profit in reflecting upon the historically revealed purpose of universities which has been *said* to be threefold: the dissemination, perpetuation and advancement of knowledge. The mission, constitution and liability of a school or college in a university are well-focused in Stephen Leacock's revelant discourse on the way he would found a college. It may be recalled that his idea was to first establish a smoking room where the students could relax and talk in an atmosphere steeped in tradition; then if any money were left he would install some books, and finally, if any remnants of the funds still survived, he would hire a professor. It is clear that Leacock had in *mind* a liberal art college, but the sound wisdom of his opinions about the relative importance of discussing, reading and listening has a lesson for engineering education. This will be extracted and applied in due course in the following. My own opinion on the desirable situation in engineering education is inferred in my plan for a memorial gift. If I make a fortune and can bequeath a statue to an engineering school, my will shall stipulate that it be erected in front of the Engineering Building and my specifications will call for a fair and lanky youth in a swivel chair with his hands clasped behind his head, with crossed ankles and with one heel resting on the edge of a kneehole desk.

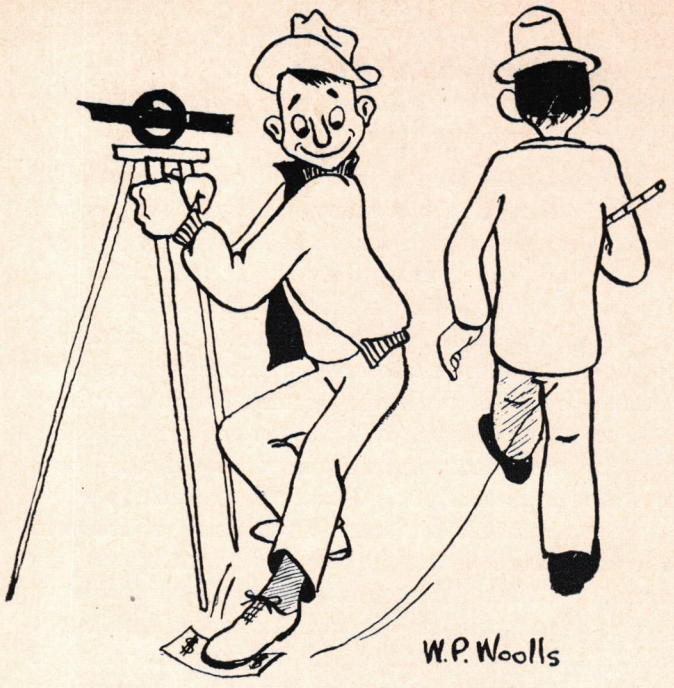


The Problems of Professional Education

In 1927, when Dean Russell retired from his long and eminent service at Teachers' College at Columbia University, he wrote in his last Dean's Report a full, clear and expressive discussion about professional education as he saw it. The main problems, then, now and previously, were the overcrowding of the curriculum, the fatigue of the students and the recruitment of the staff.

Engineering education contains problems which differ from those of the professions of law or medicine. The law is interpreted from precedents established by decisions previously handed down by the courts. Some of these are well known and clearly defined, and others are not, so the study of the law calls for immense reading for a clear understanding of the motives of men and for the ingenious application of logic. The law has a long history. Medicine has as its territory the human body. The doctors are the descendents of the ancient healers, medicine men and priests who combined much knowledge of their trade with abundant superstition. Medical research has for a long time been engaged in distinguishing these ingredients, one from the other. Medical men are occupied with a small empire, about four cubic feet of space on the average, but its contents are complicated. However, the professional medical man knows that this is the only domain with which he must deal and can concentrate on it. Both of these great professions have one thing in common in large measure; they are mainly concerned with services to individuals. Engineering is otherwise. The engineer almost always deals with matters which are the charge of groups of people accumulated either in industrial, in governmental or in commercial organizations. His duties and the medium in which he operates are subject to the widest variation. For this reason it is difficult to obtain agreement on a definition of the term "engineering" and even more difficult to be sure that engineering education is most efficiently preparing its neophytes for their tasks or careers. The work of the engineer differs further from that of the lawyer and the doctor in the important matter of organization. In his work, the engineer is nearly always one of a collection of engineers who function as an operating unit.

An engineer might be described as the intellectual amalgamation of a combined physicist and chemist who is professionally conscious of the value of a dollar, a mathematician who is willing to arrive at numerical results, a draftsman who prefers to sketch in freehand style, a team worker who has a mind of his own but who can be convinced that there is value in the views of his confederates and a reporter who can write in clear, brief style. In addition, he will be more useful in his occupation if he is an unhesitating public speaker. Few practicing engineers are called upon to make use of the whole of these attainments



. . . Who is professionally conscious of the value of a dollar . . .

in full measure, but all must daily call upon several of them in varying degree.

The Two Concepts of the Engineer

The difficulty in arriving at a unanimous conception of the function of an engineer can be illustrated many ways. Attention might be drawn to the two views of it which are prevalent in the United States. One of these, which could accurately be called the scholastic opinion, is held by many teachers throughout the land. It maintains that an engineer is one who applies the findings of physics and chemistry solidified in various electric, hydraulic or mechanical components, in a way which may be represented by equations of considerable mathematical complexity, to apparatus or processes, so as to obtain a predetermined operating characteristic from the whole. He does this and continues to do so until he ceases to practice. All of his associates are technicians, clerks, fabricators, designers, draftsmen or managers, but, in any case, not engineers. According to this view an engineer is only one who makes continued and uniformly complex use of mathematical equations. He should preferably be a free agent and not engaged by one company at a time to the exclusion of all others. The other standpoint, which might be called the industrial opinion, holds that the engineer is one who, by virtue of his knowledge of the discoveries of physics and chemistry, the developments of mathematics and the realities of economics, is enabled, after some years of experience, to see problems of product application, construction, production or management with a broad and mature view so that he is capable of making well-considered and reliable estimates of the consequences of action in one way or

another. From this standpoint, people working in the highly erudite and attenuated technical fields are seen as technicians. These opposing viewpoints, while necessarily somewhat over-simplified in this description, are authentic.

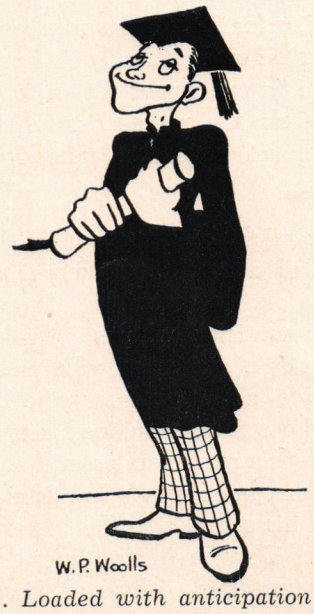
The scholastic view is the result of the experience of its holders and has many worthy consequences. It leads to the search for exact theory and thus to highly analytical course of study. It brings the discipline of mathematics to the forefront with its clear definition and logic. Its prevalence is due partly to the fact that most engineering teachers are recruited directly from the graduating classes, before they have had a chance to work in industry, and partly to the fact that the academic environment is quite different from the industrial one. Those who remain to teach at the universities are in an atmosphere of freedom and are stimulated to further endeavors by the examples of their colleagues. They grow quickly in technical competence. In rare instances, the growth is like that of a plant raised under glass which is not called upon to endure the elements; such maturity brings tall stature but weak fibre. This presently universal method of reinvigorating engineering departments yields insights which are blandly ignorant of the facts of life in industry and which thus encourage a distortion of relative values in the material which is chosen for furnishing the sparsely occupied minds of the students. The kind of maturity which a teacher must have, if he is to orient his students properly and educate them with a degree of efficiency, remains undeveloped. The resulting preoccupation with technical matters is unreal. One senses the results of intellectual inbreeding. The students are led by the doctrine that technical competence is an end in itself, worthy of their best efforts for its own sake, that technical erudition in engineering can stand alone and need have no economic justification. So it can in a university, and this is good. But young men trained this way are fitted for work in the university and not for work in industry where they must unlearn many things. In addition to this disturbing result, the trend is potentially vicious in other ways.

Thus, recognition is lost of the fact that engineering serves the needs of industry and only its more abstruse technical needs are considered worthy of attention. Actually most of the engineering work in industry is of a rather earthy character. The majority of the problems that are to be solved there are immediate and are related to operation, production, testing and sales. Ingenuity is needed, but one can leave his slide rule and his handbooks behind in many cases. Usually the simple solution is the desired one; uninterrupted performance is the aim, and complications are to be avoided. The ability to think and come to the correct result with insufficient data—that is the duty of the engineer in most cases. Many times he has great difficulty in merely defining the problem. The industrial people know this, and their view has the advantage of being real. Its disadvantage rests in the academic reality that these matters cannot be taught handily in universities. Skill in dealing with them is obtained after living with the problems. The pedagogical task of equipping young minds to meet the engineering life is well stocked with subtle difficulties.

The reconciliation of these two viewpoints in engineering is a matter of professional concern at the present time. Each convention of the American Institute of Electrical Engineers has recently contained at least one session devoted to the adjustment of this misalignment. The realities of engineering employment are rejected by the scholastic viewpoint, the fine distinction of the profession of engineering from the various skills, which are its close associates in industry, is not clear to its adherents, and they would like to see the situation of the engineer changed to meet their confined and dogmatic specifications. Throughout the nation this chasm will continue to widen until it becomes clear to the teachers that there are relatively few engineering graduates with a Bachelor of Science degree who enter the field of research and development and furthermore that the vast quantity of engineering employment is worthwhile, essential, valuable and professional. This matter is vital, as will be shown presently, and it will never be reconciled completely. The same type of misalignment exists in every kind of professional school but among the learned professions it is probably greatest in engineering. By the nature of the educational process, some of this sort of parallax is unavoidable; when it occurs in small amounts, it can be rendered harmless if the attitude of the students are sufficiently matured by alert instructors.

Problems of adjustment for the Young Engineer

The problems of living which are faced by the young engineers must be recognized, and teachers who have not held minor industrial jobs for four or



. . . Loaded with anticipation . . .

five years find this difficult. A young graduate trained, by inference, that technical erudition is in the fore is, in his first years in industry, crushed, disillusioned, balked and dissatisfied. The long period of indoctrination, of training in organizational arrangements and of assimilation of specific detail is a desperately disappointing time for a young man who can clearly remember standing, loaded with anticipation, on the front steps of an engineering school, with his head full of half-forgotten equations, wearing a black kimono and holding a square hat in one hand and a tube of high quality paper in the other. All he would have needed to avoid a disruptive shock would have been proper realization of the place of theory and of the place of mathematics in the practice of engineering.

It is true that youth is impatient and, I expect, always will be. Higher education does not and should not attempt to mature the rising generation beyond its years. Educational institutions, however, always serve the society in which they exist. Engineering education is no exception, but, if it is to occupy a position of honor, it must serve with mature insight and accurate knowledge of the needs of the society and with a sure sense of the psychological and intellectual needs of the students.

Liberal Engineering Education

There is a use for the word, liberal, in engineering education. A liberal engineering education would be ample, abundant, generous, classical, adequate, bountiful, harmonious, broad and thoughtful. It would not be a hurried, harried, urgent, discordant, burdensome race against time. It would have fewer deadlines and more thinking time. An overcrowded program of studies is no asset to the acquirement of an education, regardless of its bustling activity, its apparent thoroughness and its bright array of important courses. Hurried learning is excellent as an occasional concentration of effort but it is wasteful and deadly, if continued. Engineering education has been sick with such pedagogic hyperthyroidism since it was taken out of the hands of the foremen and master craftsmen in the nineteenth century. One can study the dean's reports of any engineering school in the country and discover that there never was a time when, nor a place where, the engineering curricula was not overcrowded. The lengthening of the program of study from four to five or six years has been and is being tried as a measure to improve this condition. It results in five or six overcrowded years rather than only four. Nothing is gained and much is lost by undirected undergraduate academic activity in professional education, but students must be given time and occasion to think and ruminate. Forcing a student to organize his work and to make full use of his time is an important and efficient way of ridding him of slothful habits; however, one term of this cluttered kind would teach him. Living through four or more terms of such medley merely causes him to find means of escaping the burden. In this he is ingenious. Overloading him with academic work acts to his detriment by equipping him with habits of haste which have no place in engineering calculations.

In regard to lengthening the curriculum, there are in engineering education two dangers in too much schooling, and these are different from risks of overschooling in the liberal arts. In engineering there is the likelihood that the person who knows too many theories will be hindered in solving the problems which face him by the difficulty he will have in deciding which theory to apply. This is a common embarrassment among young graduate engineers. Also, the young engineer who is too well versed in theory is grievously threatened, by the possession of so much intellectual freight, with the probability of knowing some things which are not so. There are many examples, some of them outstanding, of engineering accomplishments which were achieved because the parties involved did not know they were theoretically impossible. There is advantage in enlightened ignorance occasionally.

The solution of the instructional and educational problem in engineering lies neither in a longer program of study nor in a single undergraduate engineering degree but rather in coordination of teaching, in teaching fewer courses and in teaching liberally and with a light touch. Students naturally concentrate on the work of a driving teacher to the damage of their educational program. One profitable way of meeting this difficulty is to reinstate the system of daily recitations; this is an effective means for keeping a class up to date in its reading and yet not burden its members with detail which must be handled thoroughly if it is to be done at all. Such reinstatement would also reduce the amount of time devoted to lecturing—profitably in most cases.

The Lecture Method Misapplied

The practice of lecturing a class of students with material taken from a textbook which they all own and which they all can read is probably the most senseless way of illuminating immature mentalities which has yet been devised. There is one exception and that is the more infirm system of lecturing from a text other than the one the students have been instructed to buy. These rituals are not only inane but are also damaging to the students, who are often thus permitted to avoid reading the book. Many students have gone through the larger part of a program without opening their books except to locate problem assignments. Such perversion lays a blight on individual initiative and debases teaching. As a consequence of it most engineers are forced in later life to learn to understand what they read—at a time when a mistake can be expensive. In this light one can appreciate the wisdom in Stephen Leacock's humor. The great trouble with this degradation of

the lecture system of instruction is its waste; not only time is wasted but with it the opportunity of enlightening young minds. That is the golden opportunity. Why would one teach, if he were not willing and anxious to assist students toward understanding and insight? What is a more important occupation for a man than this? The mass poverty of intellect that would permit this method of instruction to exist from ocean to ocean while well-constructed books tumble from our printing presses in immense profusion simply cannot exist. The reason this pernicious and benighted custom has been held over from the days before textbooks were available is that the teachers feel obliged to read the books aloud because the students are injudiciously overloaded. What other reason could there be?

The perpetration of this barbarism is universal, and is therefore erroneously considered inevitable. The development of photo-offset printing has done much to solidify it. The lithoprinters are busily engaged in petrifying lecture notes which should be fleeting things in most cases and, if embalmed this way, will last too long and be an embarrassment. The advertising of one printing firm which campaigned the schools of engineering recently is an innocent text on how to teach badly and how to enhance an academic reputation cheaply and, one might add, at the expense of the students. Such encouragement displays impoverished conceptions of the virtue of the printed word. There is little doubt that our national capacity to print has far outgrown our native capacity to produce material worth printing.

The reason for the continuance of this out-of-date use of the lecture as a means of edifying the youth lies in a misplaced sense of responsibility on the part of engineering educators. The teachers are faced with the necessity of the parsimonious selection of material from the vast accumulation of engineering knowledge, a task, as has been noted, for which they have questionable qualifications. Having made such selection, they are then faced with the problem of presenting it to the students and this is where they see their chief responsibility. They present the material, often with rare skill, and conceive that their duty is accomplished; this is the common idea of the word, teach. One has a righteous feeling of accomplishment at this task, there is much hustle in it and much exchanging of sheets of paper. However, the pace is always so rapid, the application of the material so tenuous, and the relationship of it to other courses so obscure, that the students are unable to sort it out in their minds and thus come to rely on practically pure memory. Engineering education is an outrageously expensive and inconvenient way of accomplishing memory training. It is true that the lecture method properly applied will cover less ground at first but it would have incomparably improved long range benefits, and it would place the emphasis and responsibility on learning, where it belongs. In engineering education the psychological conditioning of the student for learning has uniformly been ignored. The result is the annual propulsion from our technical schools of tens of thousands of half-trained but largely uneducated and unnecessarily immature graduates.

Defects of the Lecture Methods Misapplied

The effect of this method of tutelage is to transform the teacher from an intellectual leader into a combination of brainy boy scout master and crutch. By their dependence on the instructor the students are cheated of the opportunity of displaying initiative; they are led to rely on the daily spooning out of the course material with perhaps a joke or two to make it more palatable. This is altogether the wrong way to learn. Learning is a private matter; the individual is obliged to do it himself. The realization that one can learn from a book unaided is a maturing discovery, which college students should have made many times. The lecture should supplement the book with touches of history, interrelationships with other courses, interpretations, discussions of accuracies to be expected, ranges of application, or any of the profuse variety of such things that a teacher might be inclined to comment upon. The value of this to the student lies in the quickening of his imagination and interest as a result of the larger prospects thus revealed. The lecture method properly applied yields enormous encouragement to intellectual growth and maturity.

The ravages of this atrophy which has afflicted engineering education can be seen in this city where large numbers of adult engineers are ever willing to take courses in almost any subject. The New York Section of the American Institute of Electrical Engineers offers at least six such courses each spring and each fall, which are attended by people who would save time and money and would learn more and accomplish more by going home and reading books on the subjects. The education of these people has made them dependent upon instructors. This is a grave disservice of engineering education and should not be permitted to continue.

There is one other difficulty with the lecture method when so prostituted. It leads to dogmatic acceptance of the textbook material and to the complete loss of insight as to how any given technical situation happens to be thus. In electrical machinery for example, the elementary textbooks usually first review the laws of the electric and the magnetic circuit, the electrical properties of materials, and the laws of magnetic induction. This material is followed by a chapter on the construction of machinery and others on the performance, characteristics and applications of the machines. All obstacles are removed for the understanding of the useful abstractions about machinery, and this is helpful. However, if left uninterpreted, it cheats the student in at least two ways:

(Continued on page sixteen)

NEWS AND VIEWS

ASME CONVENTION

The American Society of Mechanical Engineers held its national spring meeting in Washington from April 12 through April 14 this year, at the Hotel Statler. Approximately 900 ME's and guests attended the meeting, including about forty students from George Washington University. Several students from GW also acted as aides at the sessions.

The ASME is separated into twenty divisions, and as each of these divisions held technical sessions and heard the presentation of papers in its field, there was a large variety of subjects from which to choose.

In addition to the technical sessions, there were a number of field trips made, to PEPCO's Potomac River Generating Station, the U. S. Naval Engineering Experimental Station, the David Taylor Model Basin, the Bureau of Standards, and the laboratories of the Timber Engineering Company. There were a number of interesting exhibits at the Statler also, including several gas turbine models on display, one of which was a 250 pound, 175 horsepower gas industrial turbine manufactured by the Boeing Aircraft Corporation.

Our own Engineering School was well represented at the meeting. Dean Feiker presided at a luncheon on April 13, at which Mr. William C. Foster, an engineer and present Deputy Administrator of the ECA, spoke on "The Marshall Plan—An Instrument for World Peace." Professor Cruickshanks was chairman of the committee which planned the inspection trips, Professor Greeley was in charge of the entertainment committee, and Professor Kohloss represented the Washington Section in a panel discussion by the Junior Committee on the evening of April 13.

Norman Henry, president of the George Washington University Student Section, attended the ASME dinner as the guest of the Old Guard, a group of ASME members of thirty-five or more years standing.

WASHINGTON ENGINEERS' CLUB

The Washington Engineer's Club, which started from a few members just over two years ago, has developed in that short time to a membership of three hundred and eighty-one, with 46 non-resident members, 12 juniors, and 322 full members. The Club rooms, in the National Theatre building, were redecorated during this year by the owner, office equipment and supplies have been increased, and luncheon service, dinner service, snack bar, card rooms and cocktail lounge are now open six days a week until midnight.

Arrangements for reciprocal privilege have been made with practically all important engineers' clubs in this country and Canada, except the New York club, which does not exchange facilities with any other club. Steps have been taken to make such arrangements with foreign engineers' clubs such as those at Geneva, London, and Paris.

Engineers, architects and other persons in the engineering or architectural professions or allied arts and sciences, over 21 years of age, who are of good character and repute, are eligible for admission to membership in the Club in four membership grades. The admission fee for full membership is fifty dollars, for junior membership (under 30) is thirty-five dollars; life membership is one thousand dollars. Members of the immediate families of Club members are invited to make use of the club facilities at any time, but the rights and privileges of members are personal and are not transferable.

During the last year the general technical, business and social meetings of the Club have averaged about two per month. In addition there were meetings of the club women, a club refresher course and special activities including a series of technical lectures, fishing parties, a dinner-dance, card party and a golf tournament. In addition, portions of the club quarters have been reserved for 86 meetings of other groups in addition to those connected with the club.

Membership dues in the club are thirty-six dollars annually for full membership and twenty-four dollars for junior members. Dues are payable annually or quarterly in advance. Information on membership, and other rules, may be obtained from Mrs. Lacey W. Coad, Executive Secretary of the Club. Graduates will find a friendly and helpful attitude on the part of other members, as well as real enjoyment of the recreational facilities which are available at the club.

CROSWELL WINS PAPER PRIZE

The *Mecheleciv*, representing the students of the School of Engineering, offers its congratulations to Harry Croswell, who placed second in the annual ASME Regional Student Conference paper contest.

The annual Regional Conference, held this year at the U. S. Naval Academy at Annapolis, Maryland, consists of representatives of fourteen schools in the region from northern New York to the District of Columbia. The meetings extended for two days, from April 14 through April 15.

Croswell won second place in the paper contest with his paper on "Allowances for Time Study in Industry". First place went to the representative from Drexel Institute, who is described by our correspondent as "a cute blonde". We do not mean to imply that the beauty of the young lady exerted influence on the all-male judges, of course. Villanova, Delaware, and the Naval Academy placed third, fourth, and fifth, respectively.

ENGINEERING SCHOOL CALENDAR

May, 1950

May 3—Wednesday—Societies Meet, 8:15 P.M.

May 6—Saturday—Sigma Tau Party, 9:00 P.M., Cameron Club

May 10—Wednesday—Engineers' Banquet, 6:30 P.M., Y.W.C.A.

May 11—Thursday—Engineers' Council Meeting, 8:15 P.M., Student Union Annex

May 17—Wednesday—Theta Tau Meeting

ALUMNEWS

The Mecheleciv, in accordance with its policy of making its pages available to engineering alumni organizations, is pleased to publish the following items concerning the Theta Tau alumni association.

The National Capital Association of Theta Tau held its spring quarter meeting on March 27, at the Washington Engineers' Club, in the National Theatre building, and elected the following slate of officers for the coming year: *Merrill R. Brown,* President; *Harold B. Thomasson,* Vice-President; *Charles F. Myers,* Secretary; and *Ervin J. Liljegren,* Treasurer.

The Association has also elected an Executive Committee which will meet with the officers from time to time for the purpose of transacting any routine business on the agenda. This committee is composed of *Bert Randall, Ewing Ballow,* and *Vincent Hennessy.*

Another meeting of the Association was held on April 22, also at the Engineers' Club, but its purpose was pleasure instead of business. Festivities for the evening included several well-patronized card games, a number of small "old home weeks" for groups of alumni, and considerable elbow bending by all who attended.

Chuck Myers, BEE '49, has recently accepted a job on the engineering staff of the Vickers Electric Division of Vickers, Incorporated. Chuck is the new secretary of the Theta Tau alumni association, and urges all brethren to contact him at 106 George Mason Drive, Arlington, Virginia, if they are not getting notices of the meetings.

Mike Murray, BME '45, is the new regional manager for the southwestern district of the John J. Nesbitt Corporation. The district is comprised of Texas, Louisiana, Arkansas, and Oklahoma. This corporation manufactures and distributes air conditioning and heating equipment. Mike's home office will be in Dallas, Texas.

Three recent graduates are employed by the Bureau of Reclamation. They are: *Morgan Percy,* BCE '49, in the Program section of the Washington office; *Harry Balmer,* BCE '48, in the Design section on the Grand Coulee dam project; and *Bill Lowery,* BEE '49, in the Power Utilization branch in Denver, Colorado.

Fremont Jewell, BCE, '48, and former campus President of the Student Council, writes to us from Denver, Colorado, where he is employed in the offices of Milo Ketchum, son of the well-known structural engineer by the same name.

A recent letter from *Bill Sutherland,* BCE '48, informs us that he has more or less reluctantly forsaken sunny Puerto Rico for cold New England and graduate work at MIT. In addition to his studies, Bill is a full time member of the Civil Engineering staff, doing research work and some occasional teaching. His major field is Soil Mechanics and Hydraulics. Bill's latest word is that compared to MIT, we are all having a picnic here. This strikes us as being pure and unadulterated bum dope. At any rate, our professors don't seem to know that this is supposed to be a picnic. Bill would like to hear from the boys, and can be reached at Room 1-336, Massachusetts Institute of Technology, Cambridge, Massachusetts.

Erv Liljegren, BS in Eng., '49, last year's Sigma Tau president, and winner of the ASCE senior prize paper contest, is still with the National Institute of Health in Bethesda, Maryland, functioning as a chemist and safety engineer. Erv and his charming wife were out for the Theta Tau Initiation banquet and dance.

Vincent Hennessy, BCE '48, is employed as a field engineer by the Kennedy-Chamberlin Development Company, developers of Kenwood and other Washington communities. Vince is also a part-time instructor in the CE department here at George Washington University.

More George Washington University alumni have been unearthed at the Navy Department. They are: *J. Harold Link,* BEE '40, in the Bureau of Ships; *Bill Gaines,* BME '48, and *Frank Weathersbee,* BME '49, in the Bureau or Ordnance; *Dick Fenton,* BME '47, at the Naval Research Laboratory; and *Ewing Ballow,* BME '44, at the Naval Gun Factory. *Bernie Bernstein,* BME '47, has turned traitor to the profession. He is listed as a PHYSICIST at the Naval Research laboratory.

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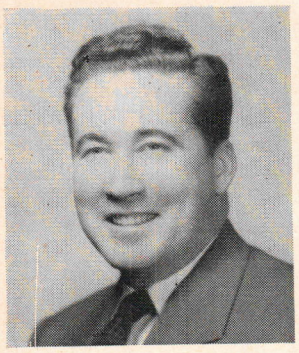
ENGINEERING PERSONALITIES

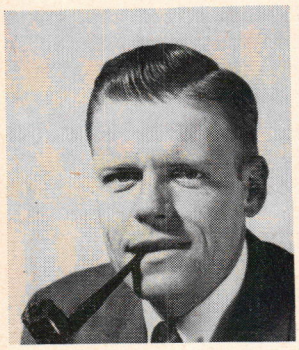


John McPhail was born in Nashville, Tennessee, on January 8, 1920. Nashville Public Schools provided his education until he graduated from high school, shortly after which he took a job with the War Department, as a Liaison Agent for the War Department's Engineers in the Canal Zone. War brought John back to the States and the Army Air Forces. Rumor has it that many shavetails and an occasional captain found themselves saluting him snappily, having overlooked his sergeant's stripes because of his enormous stature.

Following his marriage, on April 18, 1945, and his discharge, in 1946, an important event occurred in John's life. He came to THE University that year.

During these four years spent at G.W., John has become a member of Sigma Chi (1947), and of Theta Tau (1949). He was also in the recently initiated Pledge Class of Sigma Tau. Besides being the number one flash-and-shutter bug at many a party, he maintains an interest in guns and shooting which is limited only by the demands on his spare time.

Having come here in June, 1946, to study Electrical Engineering, John began his association with the AIEE, as one of the hard-working night students. In 1949, John found time to assume the duties of president of the AIEE, as which he was instrumental in the increased program participation by the membership and by the organization as a whole. Some of the activities which took place under his direction include preparations for the Regional Conference of 1950, and attendance by a large group of E.E.'s at the winter meeting in New York, last January. The Regional Conference, for which the University is scheduled to be host, will take place sometime in November, 1950. The AIEE membership has increased considerably during John's administration, the eventual goal being to make every EE an interested regular member.

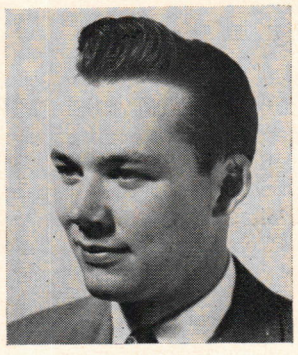


Norman Henry falls into that exclusive group of George Washington University students who were born and reared in the District of Columbia. Graduating from Central High in 1941, he volunteered into the Navy. After about two years in the North Atlantic on CVE, his activities were shifted by the Navy to the South Pacific for another two years.

Discharged in the fall of 1946 as an AMM1c, Henry spent his first civilian years over a drafting table in the Municipal Architect's office of the District of Columbia. Starting in at George Washington, Norman soon decided that engineering school was a full time job.

His first extra-curricular activity was playing football for the Ramblers, where his 6 ft. 3 in., 215-pound hulk was a terror to the opposition. In his sophomore year he joined the American Society of Mechanical Engineers. He was elected president of the organization in his Junior year. Under his chairmanship the Student Branch of the ASME is now completing a most successful year here at George Washington. It is perhaps merely by coincidence that one inspection trip of the ASME this year was a visit to the Christian Heurich Brewery. After viewing the plant operations, the members sat down in the pleasant company hall to sample the products.

The basic problem of all the societies is maintaining a good membership and in holding the members' interest so that they will continue to attend meetings. The ASME membership drive started an registration day and continued with recruiting contacts in Mechanical Engineering classes during the first weeks of school. To insure attendance at the meetings, a scheme was hit upon that is worthy of note by all other societies. In addition to the usual posters and the postcard meeting notices, a system of assignments for contacts was worked out, so that every member was personally informed of the meetings.



Thomas E. Mutchler, Jr. who has shepherded the American Society of Civil Engineers for the last year as President of the Student Branch, was born right here in the District of Columbia on October 17, 1928. After the preliminary years, he attended Roosevelt Senior High School and graduated there. Tom entered the Engineering School at George Washington University, and has held two scholarships, the Henry Harding Carter Scholarship and the Emma K. Carr Scholarship. He expects to graduate with the class of '51.

As for Tom's social life on campus, he is commonly referred to as the Casanova of Corcoran Hall. His immediate goal is the acquisition of a cream-colored convertible Pontiac. He is a member of Alpha Theta Nu, the American Society of Civil Engineers, Theta Tau, and Sigma Tau, as well as the Junior Chamber of Commerce of the District of Columbia.

During the summer of '47, Tom got a job with a construction firm and at the end of last summer he kept his job full time and came back to school at night. He is now working as Assistant Supt. of Construction for Herman W. Hutman, owner and builder of sections 4 and 5 of the Shirley-Duke Apartment project.

Elected to the Presidency of the student chapter of the American Society of Civil Engineers for the current year, Tom has worked hard and sincerely to select interesting speakers for the meetings, to encourage attendance at the meetings, and to promote a well-rounded social program for the Society to go with the technical meetings.

● The May meeting was held jointly with the AIEE, at which time we were addressed by Mr. Duncan Saunderson of the National Bureau of Standards. Mr. Saunderson's talk covered magnetic fluids, the magnetic clutch, their construction, and applications.

The election of next year's officers followed. Our leaders for next fall will be: Fred Battle, Chairman; Claire Kennedy, Vice Chairman; Herman Norwood, Treasurer; Willis Vary, Secretary; Paul Cooper and Paul Meissner, Engineer's Council Representatives.

It is hoped that by now all the hard-hitting members of IRE and AIEE have recovered from the ball game last weekend. The outcome will not be discussed in the interest of harmony between the two societies. The only thing we both will agree upon is that the game was well worth while. Once again the score was kept by empty bottles, and as refreshments decreased in quantity, spirits rose. BIG JOHN, star pitcher for AIEE, led his team in the glorious cause, whereas the IRE wants to extend its heart-felt congratulations to WILD BILL Carley for his inspirational leadership throughout the game. He had to be replaced early in the game; nevertheless, he carried on in grand style from the sidelines. Another recruit from North Carolina, Bill Dickenson, seemed to be having a wonderful time. Although he couldn't find the bases, he found the bar.

● At the April meeting, the GWU student chapter was honored by having as guest speaker one of the outstanding citizens of the District of Columbia, General Ulysses S. Grant III. The subject on which the former chief of the National Capitol Park and Planning Commission spoke was "Immediate Problems of City Planning in the Nation's Capitol." The discussion was primarily limited to the new DuPont Circle Underpass and the proposed spanning of the Anacostia River, both of which have aroused much controversy among local authorities.

General Grant demonstrated convincingly that the underpass was really the result of incomplete planning on the part of the designers in considering Connecticut Avenue and not Massachusetts Avenue as a main artery of suburban traffic. The latter thoroughfare will probably have a much higher rate of traffic with future development of residential construction. The injury to Connecticut Avenue business, a matter now in court, was also affirmed by the speaker. The theories of both the NCPPC and the District Commissioners regarding the most logical site of crossing the Anacostia River were expounded and enumerated by numerous maps of existing and proposed thoroughfares. General Grant concluded his talk with a slide lecture illustrating interesting features of Washington many years ago.

The next meeting of the Chapter will be held on Wednesday, May 3 and will be devoted to the presentation of student papers and the election of officers for the coming year. All members are expected to attend this important meeting, and all guests will be very welcome.

● Evidently the recent conference didn't constitute enough party life for one semester, so a stag party was held at the Phi Sigma Kappa fraternity house on April 7. While many of the brothers said they couldn't find it, enough of them fought through the wilds of DuPont Circle to make it a fine party. Sam Collins was so enthusiastic about it all that he brought his wife. When he realized his mistake it took him an hour to explain. According to Sam, she wasn't mad at all.

The party really got under way when John "Half Keg" McPhail managed to round up enough men for a small penny-a-chip card game. Everyone got so excited playing cards that they practically gave up beer drinking—except for Al Craft, who managed to knock over two pitchers and four glasses in about half an hour. No one seems to know who won, but I understand Past Regent Titrington has enough to pay for his wife's future hospital bills.

A stag party was held at the Engineers' Club of Washington on April 22 for all alumni, actives and prospective pledges. The party, an annual affair, is part of the Alumni Association's program of bringing the alumni and active chapters closer together. As usual it turned out to be a bang-up party.

At the regular chapter meeting on April 12 the chapter elected the following officers: John Lewis, Regent; Thomas Mutchler, Vice Regent; Chuck Plyer, Treasurer; Ed Davitt, Scribe; Bill Seabrooke, Corresponding Secretary.

● On Wednesday, March 22, the AIEE and the IRE held a joint meeting, the first of an experimental series of noon-hour meetings. Dr. Scott Smith, Chief of the Stationary Reactor Division of the Atomic Energy Commission, guest speaker for the occasion, addressed us on the Nuclear Reactor as a power source. Dr. Smith expressed the hope that some of the young, potential engineers in the audience would become interested in this new and promising field. He emphasized that there is a great need for the engineering style of thought in developing practical applications now that the ground work has been established by the physicists.

Judging from the attendance, it may be concluded that more noon-hour meetings should be held in the future. We realize that this would exclude many night school students; however, some arrangements can possibly be made such that all will be able to benefit from these authoritative lectures.

At the business meeting following a joint lecture session with IRE on Wednesday evening, April 5, new chapter officers were elected for the next school year. New officers are: Robert Zens, Chairman; Lynn Garrison, Vice-Chairman; Virgil Harris, Secretary; R. E. Fling, Treasurer. We sincerely hope that the newly-elected leaders will carry on as well as their predecessors.

● The student branch of the American Society of Mechanical Engineers was very fortunate in having for their speaker at the April meeting Mr. F. R. Wodtke, of the Hyatt Bearing Division of the General Motors Corporation.

Mr. Wodtke spoke on the topic "Machine Design as a Career for College Graduates." In the course of his talk and the discussion period which followed, Mr. Wodtke discussed job opportunities in the engineering field in general and on the employees selection and training policy at General Motors. Mr. Wodtke is particularly well equipped to speak on these subjects, as he has been in the employee selection and training field for many years, and he did not pull any punches in explaining what an employer looks for in a prospective employee, and how best to get that elusive job.

Student branch leaders wish to express their appreciation to the committee chairman in the branch for their fine support during this year. Next meeting is scheduled as election meeting, and members are asked to be considering who they would like to have as officers for next year. All are urged to attend this meeting, which will be a joint meeting with the AIEE and the IRE featuring a discussion on Instrumentation by an alumnus of the University, Mr. Henry M. Schmitt, of the Brown Instrument Division of Minneapolis-Honeywell Company.

● The effects of their first party had hardly worn off when Sigma Tau members commenced clamoring for another. Accordingly, at the first meeting in April, plans were made to return to the Cameron Club on Saturday, May 6. With little besides final exams to look forward to by then, a large turnout is expected.

Just to prove that parties are not the only item of business, the fraternity elected new officers and approximately sixty pledges. The new officers are: Chester Bilinski, Sphinx; Arthur Bailey, Vice President; Lynn Garrison, Historian; John Clancey. Corresponding Secretary; Kenneth Bonwit, Recording Secretary; Edward McGandy, Treasurer; Willis Vary and John Lewis, Engineer's Council Representatives.

The pledges were initiated in Studio B of Iisner Auditorium, and following the initiation a gala banquet was held at the Roger Smith Hotel. Feature attractions of the evening were a song and three skits presented by the new brothers. Now we know why vaudeville is dead.

The fraternity paused long enough to have its picture taken for the Cherry Tree. We use the words "long enough" advisedly. It took that long to enable the flashbulb to outshine the ties worn by the members.

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(*Continued from page 10*)

it fails to give him a conception of the dynamics of the growth of this body of knowledge and it fails to inform him of its most recent trends and developments. Of these, the former omission is the more vicious because this insight contains the ingredients of what Arthur Koestler has called the 'eureka process,' which Poor Richard's Almanac stated tersely and incompletely in the short sentence "Necessity is the mother of invention." The textbooks do not illuminate this properly; they are composed with different aims; they instruct without educating.

From the elementary machinery book outlined above, one would gather that the machines pictured had been developed in orderly fashion from the physical principles enunciated and by the logical sequence of algebraic calculations which are always included. One would be notably misled by this harvest. The facts are otherwise. The physical principles were developed, some of them fifty years, before practical dynamos were built. The early dynamo builders constructed many machines in all sorts of shapes and often based their designs on false theoretical premises. Poor as they were, these early machines served long unsatisfied wants for light and power in a spectacularly successful way and were improved as time passed. The important fact in this is that the engineering theory lagged the practice in time. The important truth contained therein is that original discoveries are made when determined men with restless brains encounter problems which they cannot solve with the knowledge available to them and then proceed to worry out a solution, usually by the novel association of a previously unconsidered plane of experience with the problem at hand. Educationally speaking, the momentous thing about Archimedes' Principle is not the law itself, which is well known and easily encompassed, but rather the awareness of the mental process by which it was discovered and the understanding of the intense excitement and exhilaration with which its discoverer was debauched. Every researcher understands the joy of original discovery and the students should be made to realize this phenomenon.

Teachers of engineering who experience such exhilaration in their researches are fascinated and are better teachers therefore. Intellectual gratification of this kind is an important part of the compensation in all the endeavors of men which require original thinking. The occupations of architects, engineers, lawyers, doctors, philosophers, scientists, reformers, humorists, authors, preachers, composers, men of letters, teachers and all the rest of the intellectual pursuits, where the brain is used for original thinking, reward their practitioners thus. The brain used this way grows in power and in strength. Employments requiring repetitive thinking along routine channels deaden the intellect.

The Nature of Engineering Practice

However, engineering is a bureaucratic profession; it is usually conducted from a seated position and across desks. The business of the world is largely routine and boredom is the companion of multitudes, as the people in Hollywood know well. The employment of engineers contains uncounted positions of a routine nature. Yet the employers of engineers rightly expect them to be capable of handling the unusual situation as well as the far more numerous conventional ones. There is no benefit and much harm in failure to recognize this actuality. The engineering student must be taught to expect routine work and to dispatch it promptly and he must be educated to think independently and originally. It is the duty of engineering educators to clarify, elucidate, illuminate and disseminate the knowledge of this reality so that the students will understand it.

The most productive industries are those which function on a routine basis, as Henry Ford demonstrated years ago. Routine cannot be avoided and therefore must be resolutely mastered. The way in which such mastery can be accomplished may be indicated by changing the emphasis from routine, which is a dull, uninspiring, manufacturer of intellectual relics, to regular, which is a word with a going, vital, square-shouldered, forward-looking attitude. The difference between disgruntled middle age and vigorous manhood at the prime of life is built into this slight shift in emphasis. If young engineering alumni were aware of these matters in advance of employment, one would be inclined to view their futures with more prompt assurance.

Engineering Alumni

Schools accumulate alumni just as surely as Mr. and Mrs. Gilbreth accumulated children. Such accretion follows the conduct of classes as regularly as June follows May. Those who teach in the schools wistfully hope as time passes that the alumni will perhaps stop in occasionally to talk, or maybe drop timely postcards into convenient mail boxes with some pertinent statistics written thereon about the way each has travelled in the world. These happen, but too rarely. This lack of general contact, which is a misfortune for the schools as well as the engineers, is a natural consequence of the relationships involved. If the association has been mature, mutually aggreeable and filled with manly, human friendliness, it is a mistake to fail to cultivate it as the years pass. Such neglect is lamentable for two reasons: it blocks any influence which the experience of the graduate could have on the development of programs of study, and it prevents to some degree the proper dissemination of news of job opportunities for experienced men. Alumni associations exist in all schools but these have a different purpose and do not meet the above requirements. Any such fellowship as indicated here would arise only from the sure knowledge on the part of the alumnus that his failures as well as his

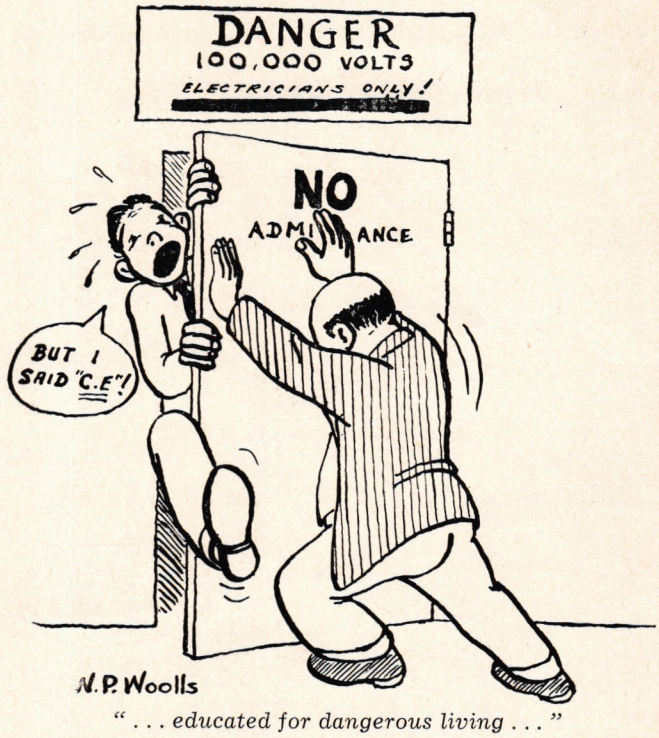
successes are of interest to the men who attempted to educate him, not from the point of view of commendation or judgment, but rather from the purely human desire for information about an acquaintance.

Practices of Engineering Education

Engineering education is carried on across the land by squads of able, informed, conscientious, mature teachers, by platoons of apprentices trained by apprentices, and by regiments of other faculty members who complete the spectrum between these extremes. Each member of this army is dignified by the sincerity of his intentions. All carry on this important task of instruction according to the light as it is seen personally. Eloquent testimony to the lack of damage resulting from their activity exists in the capacity of the industry of the nation to manufacture a profuseness of products of great or small technical ingenuity, at prices which permit their sale to multitudes. This is acclaimed throughout the world, except in Soviet Russia, where the government simply does not like us and never will, while it remains as presently constituted. Our engineering achievements are mighty. In view of this certainty, by what paradox can there be important elements of truth in the foregoing discussion? The answer to this riddle is found partly in the generations of students themselves; one is led to conclude that it is practically impossible to damage an engineer. The ample remainder of the contradiction is explained by the fact that engineering education as presently constituted is highly beneficial to its neophytes. The desire is to make it even more advantageous to the mind; to detect and alter any trends which promise damage or appear regressive.

While there is danger in change; as long as engineering teaching holds to the precept of high technical competence among its practitioners, it will be on firm ground. But this is not enough; more is needed. Maturity, insight, a sense of the fitness of things, a level headed realization of relative values, the ability to be human in the richest sense of the word, the ability to recognize the method, meaning and value of training and of education, those must also be discovered in the applicants for teaching positions. Each individual will develop his own teaching method and style according to his personality. If his insights and his philosophy are morally correct, he will develop an understanding of the effects of the program of study on the growth of the students. The older teachers, who have seen generations of students occupy their benches, have small regard for the recent trend toward the development of technicians, which is the way they view the results of the more modern training. The younger teachers, who have matured on a diet of the newer abstractions, complain bitterly that there is insufficient time to spread them upon the blackboard. As theories become more abstract they become less specific and more general and, therefore, in a sense more fundamental. These things are true, but to think such broader abstractions consequently more valuable to an immature mind is a complete mistake and a damaging one. Their educational value would seem to lie in stressing the comprehension of the student beyond its elastic limit so that, when it snaps back after the disturbing force is removed, it will remain slightly expanded. It is clear that students have slight respect for easy courses, but it is equally clear that they ought not be swindled by laborious and time-consuming courses, which are supposedly designed to result in intellectual growth and maturity, but which, instead, leave the intellect tired, surfeited and flaccid. The students are willing to work, but they have little interest in technical juggling and ritualistic roguishness.

Fortunately, technical knowledge cannot be inherited. Every student must grow in awareness and he can do this only by his own efforts. In this the teachers can help him by guidance and by example, but, most efficiently, by knowing when to stop trying to fill him up with predigested theory. The key to this matter is respect for the student and proper preservation of his right to individuality. As General Eisenhower says, he should be educated for dangerous living; any other kind of education is mere training. Hundreds of engineering teachers know these things and practice them.



". . . educated for dangerous living . . ."

Methods for Encouraging Improvements

General improvements are attainable by the uniform action of the engineering schools or by the example and leadership of the endowed schools, which do not depend wholly on tuition fees for support. Maintenance of accredited status is no barrier to proper change. There are no legal requirements governing engineering education which force it to be static. No university legislation exists which

prevents emendation in the matter of engineering education. When the engineering faculties are convinced of the corrections and desirability of amendments in engineering education, these will be made. The eternal problem facing all universities is that of obtaining teachers, and it is now seen that this is the basic matter here also. There are presently no places where engineering teachers can be taught. Such education of educators will be accomplished when a man with sufficient stature, liberal insight and suitable inclinations arises and is heard.

Engineering is a large and various plantation and the quickest way to become familiar with it is to work at it. My final admonition to student readers of the *Mechelecіv* is this: go to work and use the sense with which God endowed you. But remember to look back now and then over the path which you have travelled and perhaps exchange experiences with those who tried to prepare you, and thus hasten the time when my proposed statue of the young thinker will come closer to representing actualities in the engineering schools of the nation.

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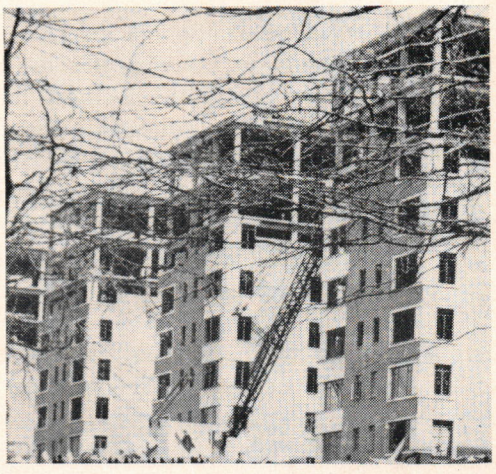

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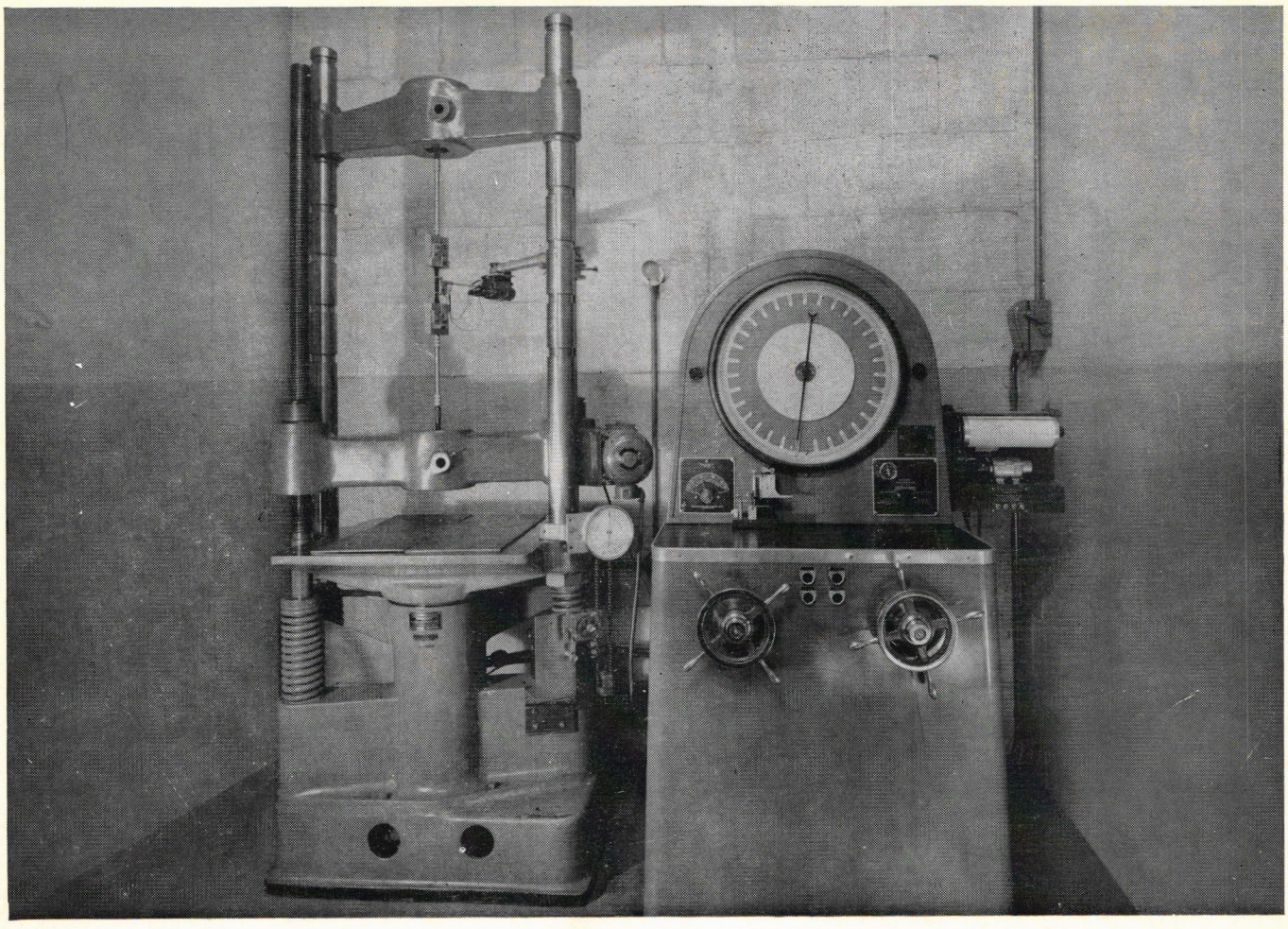

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